

ADDENDUM TO A REVISION OF CUPRESSUS L. (CUPRESSACEAE).

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It has been my privilege to study the Cupressus genus intensely since 1976. My life experience as a private collector and keen traveler has enabled me to devote a wealth of time studying one specific genus. After growing the more common species of cypress from seed indoors in New York I became quite interested in acquiring seed of the entire genus. Luckily I was fortunate enough to obtain both wild and cultivated seed of all the recognized taxa and synonyms listed in this paper from sources listed by myself in *Phytologia* 49: 420. 1981 and many other private contacts.

After raising several seed lots I began to appreciate the variability in each taxon and the relationships between each taxon. I then visited the University of Washington Arboretum in Seattle to study their cultivated cypresses in November 1979. Later I made frequent studies of herbarium material at the New York Botanical Garden in the Bronx. In November 1982 I published my revision of Cupressus in *Phytologia* 49: 390-399. I was content with my treatment of New World and Mediterranean taxa, but I was still somewhat puzzled as to the Asiatic species on the basis of limited herbarium material.

Then in 1982 I did a considerable amount of traveling to several herbaria and arboreta whom have noteworthy collections of Cupressus. In March 1982 I visited the Los Angeles State and County Arboretum in Arcadia, California. In April 1982 the Harvard University Herbaria in Cambridge (A & GH); in May 1982 the U.S. National Herbarium in Washington, D.C. (US); in July the Academy of Natural Sciences of Philadelphia (PH), and the Missouri Botanical Garden (MO) in Saint Louis during late July 1982. For ten days in November 1982 I went to the British Isles where I visited the Hillier Arboretum in Romsey, England; the Royal Botanic Gardens, Kew (K); the British Museum of Natural History in London (BM), and the Royal Botanic Garden in Edinburgh, Scotland (E). Finally I visited the Brooklyn Botanic Garden (BKL), New York in December 1982. I studied and photographed a numerous amount of herbarium specimens including type material. This list is too long for documentation here, however well over a hundred sheets bear my annotation labels of all the combined herbaria mentioned. After a thorough investigation I have now written this paper with total satisfaction of taxonomic treatments on my part and encouragements of others.

I have raised seedlings of all taxa listed in this paper. My observations reveal that all the New World taxa bear 3-4 acute cotyledons, whereas all the Old World taxa bear 2 obtusely pointed cotyledons (Silba, *Phytologia* 49: 390-399.1981 & *Phytologia* 51:157-160.1982). This undoubtedly proves that the cultivated trees of *C. lusitanica* in Portugal came from the New World. While the number of cotyledons per group is relatively constant I do not think this feature alone is enough to divide the genus into two subsections. Everthough the Old World species have non-fragrant foliage, whereas the New World species have fragrant foliage, this feature varies considerably from seed origin and is open to debate. I have been encouraged by several botanists to produce a taxonomic key. The one listed here is largely based on vegetative rather than coning characteristics. Cones are not always born on cultivated trees until they are quite old.

As of this writing I have accepted 13 species (including type varieties) and 12 varieties comprising the genus *Cupressus*. Below is a list of accepted names with their principal synonyms in brackets and their chief distribution. I have retained the number of New World and Mediterranean taxa recognized in my original revision (*Phytologia* 49, 1981), however additional research has led to the reduction of names of Asiatic taxa.

LIST OF ACCEPTED TAXA

1. *Cupressus arizonica* Greene
 - a) var. *arizonica* (typical)- sw. Arizona & northern Mexico (Chihuahua to San Luis Potosi).
 - b) var. *glabra* (Sudw.) Little [*C. glabra* Sudworth] central Arizona (Coconino to Gila Co.).
 - c) var. *montana* (Wigg.) Little [*C. montana* Wigg.]. San Pedro Martir, Baja CA, Mexico.
 - d) var. *nevadensis* (Abrams) Little [*C. nevadensis* Abrams] - Piute Mts., Kern & Tulare Co., CA.
 - e) var. *revealiana* Silba- Named after Jack L. Reveal (SD)- Sierra Juarez, Baja CA, Mexico.
 - f) var. *stephensonii* (Wolf) Little [*C. stephensonii* Wolf]- Cuyamaca Mts., San Diego Co., CA.
2. *C. bakeri* Jeps. [*C. bakeri* subsp. *matthewsii* Wolf] Siskiyou Mts., OR to Plumas Co., Calif..
3. *C. chengiana* Hu [*C. jiangeensis* Zhao] Min River, nw. Szechuan & s.w. Kansu, China.
4. *C. duclouxiana* Hickel- Pome, Tibet to Kunming, Yunnan.
5. *C. gigantea* Cheng & Fu, Tsangpo River, Tibet, China.
6. *C. goveniana* Gord.
 - a) var. *goveniana* (typical)- Monterey Co., CA.

- b) var. abramsiana (Wolf) Little [C. abramsiana Wolf]- Santa Cruz Mts., Santa Cruz Co., CA.
- c) var. pygmaea Lemm. [C. pygmaea (Lemm.) Sarg.] Mendocino County, California.
7. C. guadalupensis Wats.
 a) var. guadalupensis (typical)-Guadalupe Isld., Mexico.
 b) var. forbesii (Jeps.) Little [C. forbesii Jeps.]- sw. Calif. & nw. Baja Calif., Mexico.
8. C. lusitanica Mill. [C. lindleyi Klotzsch, C. Corneyana Carr.]
 a) var. lusitanica- Durango, Mexico to Honduras.
 b) var. benthamii (Endl.) Carr. [C. benthamii Endl.] Hidalgo; Vera Cruz & Puebla, Mexico
9. C. macnabiana Murr.- Sierra Nevada, California.
10. C. macrocarpa Hartw.- Monterey Co., CA.
11. C. sargentii Jeps.- California Coast Ranges.
12. C. sempervirens L.
 a) var. sempervirens [C. horizontalis Mill; C. sempervirens var. numidica Trab.] Greece to Iran.
 b) var. atlantica (Gausson) Silba [C. atlantica Gausson]- Oued N'Fis, Morocco.
 c) var. dupreziana (Camus) Silba [C. dupreziana Camus]- Tassile Mts., sw. Algeria.
13. C. torulosa Don.
 a) var. torulosa- nw. India & nw. Nepal.
 b) var. cashmeriana (Royle) Kent ["Kashmeriana"; C. cashmeriana Royle ex Carr.] Pho Chu Valley, Bhutan.

CUPRESSUS Linn., Gen. Pl. 294. 1737

Evergreen trees 10-60 m. tall, columnar or conical in habit with ascending branches. Branchlets are usually more or less evenly disposed around the branches and are either cylindrical or quadrangular. The evergreen foliage is the same color on top and bottom, whereas Chamaecyparis leaves are usually paler or whitish beneath. The leaves are scale-like, 1-3 mm. long, usually closely appressed to the twig, opposite, decussate, triangular, bluntly acute and ridged on back. Each leaf may be furnished with a gland which may be inconspicuous or actively secreting resin. Male and female cones are borne on the same tree, but on separate branchlets. Male cones are produced on the ends of short branchlets, are cylindrical to oblong, 3-7 mm. long, green or red eventually turning yellow. Each scale bears 2-6 anthers. The pollen granules are rounded, 27-38 microns in diameter. The female cones are red brown to gray, woody, maturing in 2 years, they usually remain closed on the branches for a

considerable time thereafter. The cones vary in length from 2-4 cm. long, are globose to ovoid and have 4-14 distichuously arranged peltate scales. Each scale bears an umbo which may be dull or sharp pointed. Seeds are irregularly oval to round, often over 100 per cone or 10-20 per scale, measuring 3-6 mm. broad. Wings equal in size on both sides of the nut, small, 1-2 mm. broad. Seedlings bear 2-6 bluntly acute cotyledons, 8-15 mm..

Type Species: Cupressus sempervirens L., Sp. Pl. 1002. 1753. Originally described from Crete. A native of the eastern Mediterranean countries from Greece to Iran and widely cultivated in mild climates.

KEY TO THE SPECIES OF CUPRESSUS

1. Branchlets more or less evenly disposed around the branches, recalling Juniperus.
2. Bark exfoliating in thin, non-fibrous, dark red scaly plates.
 3. Foliage faintly scented, gray to bluish green. Leaves acute, glands usually not secreting resin. - - - 7. C. guadalupensis.
 3. Foliage appreciably scented, grayish green. Leaves sharply acute, glands usually actively secreting resin. - - - 2. C. bakeri.
2. Bark stripping vertically between fine fissures.
 3. Branchlets divided into thin thread-like segments. Leaves narrowly acute, green to blue green, grooved on back, glands apparent, but obscure. - - - 4. C. duclouxiana.
 3. Vigorous branchlets often in a fishbone pattern. Leaves broad-ovate, obtuse, grooved on back, gray green, distinctly glandular. - - - - - 3. C. chengiana.
 3. Branchlets comparatively robust, densely arranged in rows. Leaves rhomboidal with an expanded apex, acutish, gray green, bloomed white, distinctly glandular. - - - - - 5. C. gigantea.
2. Bark thick, gray brown, fibrous, furrowed longitudinally.
 3. Leaves acute, green to gray green, glands inconspicuous.
 4. Foliage dark green, leaves not grooved on back, glands never active, noticeable scent. - - - - - 6. C. goveniana
 4. Foliage pale green, leaves sharply acute, grooved on dorsal side, glands relatively inactive. - - - - - 1. C. arizonica
 4. Foliage gray green with a glaucous bloom, bluntly acute, leaves not grooved on back, gland seldom active. - 11. C. sargentii.

3. Leaves obtuse, dark green, glands obscure.
4. Foliage has a citrus scent. Leaves not grooved on back, glands do not exclude resin. - - - - - 10. C. macrocarpa
4. Foliage almost scentless. Leaves grooved on back, glands seldom secreting resin, dull green. - - - 12. C. sempervirens
1. Branchlets flattened in small sprays, recalling Chamaecyparis.
2. Bark exfoliating in thin, long strips.
 3. Leaves bright green, bluntly acute, glands inconspicuous. Crushed foliage has a faint resinous or grass-like scent. - 13. C. torulosa.
 4. Leaves gray green, grooved on back, sharply acute with a prickly apex, glands inconspicuous. Foliage has a faint citrus aroma. - - - - - 8. C. lusitanica Mill.
2. Bark thick, fibrous, furrowed longitudinally.
 3. Leaves bluntly acute, ovate, dark green, distinctly glandular. Foliage quite heavily scented of citrus. - - - 9. C. macnabiana.

KEY TO THE INFRASPECIFIC VARIETIES OF CUPRESSUS

1. Leaves sharply acute, gray green, glands apparent and may be active. - - - C. arizonica complex.
2. Bark fibrous, furrowed longitudinally, gray.
 3. Leaves dark gray green, glands often actively secreting resin which leaves a white dot. Seeds flattened. - var. montana
 3. Leaves light gray green, glands active leaving a clear or reddish resin. Seeds rounded. - - - - - var. nevadensis.
2. Bark breaking into thin, non-curling plates, dark red.
 3. Leaves light gray green, glands seldom secreting resin. - - - var. stephensonii
 3. Leaves blue gray, much white spotted due to active glands. - - - - - var. glabra.
 3. Leaves gray green, sparsely white spotted, glands often secreting resin. Bark only partially exfoliating. - - var. reveliana.
1. Leaves green to dark green, bluntly acute, glands inconspicuous. - - - C. goveniana complex.
 2. Leaves dull, blackish green. Seeds shiny black, warty. - - - - - var. pigmaea.
 2. Leaves bright light green. Shoots often exhibit rapid growth. Seeds brown, often glaucous, rarely warty. - - var. abramsiana
1. Leaves bright green, sharply acute, fragrant, glands generally absent. - - C. guadalupensis var. forbesii.

1. Leaves obtuse, dark green, glands apparent and sometimes excluding resin.- C. sempervirens complex.
2. Branchlets in short flattened sprays. Foliage sometimes aromatic. Leaves bearing active glands on young trees. Female cones ovoid with 10-12 scales. Seeds with large wings. var. dupreziana.
2. Branchlets in flat sprays. Foliage with faint resinous scent. Leaf glands active in young trees. Female cones globose, with usually 8 scales. - - - - - var. atlantica.
1. Leaves sharply acute, glands inconspicuous and rarely active. Foliage faintly scented.
2. Branchlets in short flattened, fern-like sprays. Leaves pale green, apex sharp-pointed, glands abundant on young plants. - - - C. lusitanica var. benthamii.
2. Branchlets in long, pendulous, chain-like segments. Foliage a silvery blue. Leaves in juvenile state. - - - C. torulosa var. cashmeriana.

GENERIC CONCEPTS

The conservative treatment of the New World cypresses by Little (Phytologia 20:429-445. 1970) seems to be gaining recognition in the United States and France. A recent textbook by T. Elias (Trees of N. Amer. 1980) has followed his treatment. As well as Y. Birot in a bulletin of the Comunita Economica Europea (Nov. 1979 Seminary:69-78) and P. Allemand (Com. Econ. Eur., Nov. 1979 Seminary: 51-67). A noted Gymnosperm specialist Dr. Thomas Zanoni, formerly with the New York Botanical Garden (NY) and now working in the Dominican Republic, had annotated the Cupressus specimens at NY in accordance with this treatment. Also, Johnson (USDA Agr. Handb. 450:363-369. 1974) accepted the treatment of Little (1970).

The Cupressus arizonica complex includes six varieties based on vegetative differences and geographic distribution. Wolf (Aliso 1:5. 1948) admitted that all these taxa were closely related and may one day be recognized as infraspecific varieties.

Distribution maps of other United States Gymnosperms by Little (Atlas of US. Trees, 1, 1971) shows that Abies concolor Hildebr. has a similar distribution, but only one variety besides the type is distinguished. Munz (Calif. Flora. 1959) lists many species of Angiosperm genera that have five varieties in California alone. Particularly Rhamnus californica Esch. which has five geographic varieties that were once viewed as separate species. Rhamnus californica also

has a similar distribution in California, Baja California, and in Arizona like Cupressus arizonica.

The varieties of C. arizonica can be divided into two groups, one with furrowed bark and one with scaly bark according to my key. Similarly Pinus contorta Dougl. has furrowed bark, while a geographical variety, var. latifolia Engelm. has scaly bark. Three or more varieties of P. contorta are recognized, the type occurs on the California Coast, var. murrayana Engelm. occurs in central California and northern Baja California, while var. latifolia occurs in the Rocky Mts., Colorado.

The C. arizonica group bears a relationship to C. bakeri, C. lusitanica and shows parallel features with C. chengiana and C. gigantea in bark and leaf glands.

Cupressus bakeri subsp. matthewsii Wolf was reduced to synonymy with the type by Little (1970) and has also not received general acceptance in the literature. For horticultural purposes it may be retained as a cultivar since it is faster-growing than the type. Additional populations of C. bakeri were reported by Griffin & Critchfield (Distr. For. Tr. in Calif. 1976) that Wolf (Aliso 1:72.1948) was unaware of. These populations included intermediate forms between Wolf's two subspecies of C. bakeri.

The three Chinese cypresses C. chengiana, C. duclouxiana and C. gigantea are not well known and have led to confusion in the literature with C. torulosa. I reduced C. jiangeensis Zhao to synonymy with C. chengiana in Phytologia 51:157-160 because of the lack of botanical features and distribution distinguishing the two. Cupressus duclouxiana resembles C. sempervirens and shows parallel features with C. goveniana and C. macrocarpa in its obscurely glandular leaves and large cones, but its foliage is nearly scentless.

The C. goveniana complex has three varieties based on size of cones and color of foliage and seeds. As pointed out by Little (1970) Pinus contorta shows a similar distribution. A variation, P. contorta var. bolanderi Vasey occurs in the Pine Barrens of Mendocino County as does C. goveniana var. pigmaea. Fossil remains studied by Axelrod (Madrono 29:127-147. 1982) shows that C. goveniana and C. macrocarpa once had a larger distribution to the north and south of their current populations. Changing environmental factors made them retreat to the California Coast in search of warmer climates. The question arises as to why would one reduce taxa of Cupressus that have small populations to varietal rank and then leave C. macrocarpa as a species. A similar instance is

noted in Abies bracteata Don which is restricted to the Santa Lucia Mts., Monterey Co., California. The reason Abies bracteata and Cupressus macrocarpa are distinguished as species from other members of their genus is because of outstanding differences in bark, leaves and cones. Cupressus sargentii is widely distributed in California and shows botanical affinities to C. goveniana. Cupressus goveniana var. abramsiana is intermediate in chemical characters between C. goveniana and C. sargentii (Zavarin, Phytochem. 6:1387-1394. 1967).

Cupressus guadalupensis may be a descendant of C. macrocarpa and shows parallel bark features with C. arizonica var. glabra and C. bakeri, but is not closely related to those species. Cupressus guadalupensis var. forbesii occurs on the California mainland while the type is confined to Guadalupe Island. Similarly Pinus radiata Don occurs on the California mainland, while a variety, P. radiata var. binata Lemm. occurs on Guadalupe Island, Mexico.

Cupressus lusitanica is a highly variable tree in the wild and in cultivation. It is naturalized in Central America, Portugal and perhaps India. Cupressus lusitanica is widespread throughout Mexico to Honduras. As such it is obviously the ancestor of var. benthami, formerly recognized as a separate species and restricted to three states in northeast Mexico. Cupressus lusitanica exhibits parallel features with C. sempervirens and C. torulosa in that they all have inconspicuous leaf glands and varieties with flattened branchlets. Cupressus macnabiana also has flattened branchlets and exhibits parallel development with these three species.

Because of its widespread distribution and gray green foliage with inconspicuous glands C. lusitanica may be the ancient ancestor of all the New World cypresses. Possey and Goggans (Auburn Univ. Agric. Exp. Sta. Cir. 160, 23 p., 1968) suggested that there may have once been one widespread species throughout the southwest. In reviewing the entire genus it must be noted that many taxa are represented by small populations. This is due in part to geographic isolation caused by natural disasters including man, fires and climatic changes.

Controversy has arisen as to which of the two forms of C. sempervirens, known as horizontalis and 'stricta' was described by Linnaeus (Sp. Pl. 1002. 1753). Examination of that text reveals that Linnaeus described the plant from Crete where the horizontal form is endemic. Perhaps



Fig. 1. Cupressus sempervirens var. dupreziana on left, Leredde 800, Tamrit, Algeria, 1700 m., 23-5-1949; Cupressus sempervirens on right, Holotype-Linneaus s.n., Isle of Crete, ca.1753 in Hortus Cissus Cliffortianus [(BM) both var.].

Linnaeus viewed the horizontal form and the 'stricta' form as separate sexes of the same plant. Nevertheless, 'stricta' does not always come true to seed and is not known in the wild (Mitchell, Conif. Brit. Isles. 1975). Therefore since the horizontal kind was referred to by Linnaeus it should be recognized as the type, whereas 'stricta' should be retained as a cultivar.

I reduced C. sempervirens var. numidica Trab (Bull. Soc. Hort. Tunisia et Rev. Hort. Algerie. 17:309.1913) on the basis that it only differs from the type in its upright branches leaving the trunk at right angles. Whether this feature is constant throughout the population in central Tunisia is open to debate. This taxon was not recognized by Barry (Soc. Hist. Natur. Afr. Nord. Bull. 61:95-196. 1970). However, for horticultural reasons it may be retained as a cultivar.

Cupressus torulosa has parallel affinities with C. lusitanica, C. macnabiana and is perhaps related to C. chengiana and C. gigantea.

The plant cultivated in Europe as C. torulosa var. corneyana was originally described in my opinion from cultivated trees of C. lusitanica in India. Mitchell (Trees of Britain. 1974) describes this variety with twisted branchlets and yellowish green foliage. This is not at all similar to the specimens collected in Bhutan by Griffith and Cooper that have flattened branchlets in longpendulous chains. I raised seed of C. torulosa corneyana in 1978 from the Station de Botanique et de Pathologie Vegetale, Antibes, France. This lot bore seedlings with 3-5 bluntly acute cotyledons over 12 mm. long which well agreed with C. lusitanica seedlings raised from Portugal in 1982 from the University of Lisboa. I had sown seeds of C. torulosa from Schilling 2412 (BM) from central Nepal which bore 2 obtusely pointed cotyledons under 10 mm. long very similar to those I raised as C. cashmeriana in 1977 from the Les Cedres Botanical Garden, Saint-Jean-Cap-Ferrat, France.

Franco (Portug. Acta Biol. Ser. B. 9: 183-195. 1969) apparently viewed corneyana and cashmeriana as synonymous with each other on the basis of one incorrectly labeled herbarium specimen [C. corneyana Gordon, Gordon s.n., Knight Nursery, England, ca.1847 (K)] and no comparison of living plants. A specimen labeled C. corneyana collected by Shuttleworth s.n., Hort. Huber Hyeris, England, 23-12-1862 (K) has branchlets evenly disposed around the twig, adult leaves with a spiny apex and cones with prominent umbos typical of C. lusitanica, Moller 214, 3-1887, Bussaco, Portugal. The plant listed by Hillier (Man. Trees & Shrubs. 1978) as C. torulosa var. corneyana



Fig. 2. Cupressus torulosa var. cashmeriana (top left); C. semper-virens var. dupreziana (bottom left); C. arizonica var. revealliana [drawing by Bobbi Angel (NY) top right]; C. arizonica var. revealliana (bottom left); all specimens at NY-cone draw..

is comparable to their C. lusitanica 'flagellifera' which bears large cones that are not conspicuously glaucous as in the type. In conclusion I herewith reduce C. corneyana Carr. to synonymy with C. lusitanica, however it may be retained as a cultivar under the latter species for horticultural purposes.

In my revision of Cupressus (Phytologia 49. 1981) I reduced C. cashmeriana as a cultivar of C. torulosa because both taxa have thin shreddy bark, reddish cones with 10-12 scales, non-glandular leaves with pale margins and seedlings with 2 obtuse cotylens 8 mm. long. Also because it was not known wild. However, examination at Kew of Henry s.n., 3-9-1909, Isola Madre, Italy well agrees with Cooper 3886, 11-5-1815 from Chalimarphe Thimpu, 7500 ft., Bhutan (E). Both specimens have long, pendulous flattened branchlets, though the individual color varies this is not an important feature. These specimens agree with those described wild in Bhutan by Long (Notes R.B.G. Edinb. 38: 311-314. 1980). Since it is now known wild I am recognizing this taxon as C. torulosa var. cashmeriana (Royle ex Carr.) Kent (Veitch. Man. Conif. 2: 284. 1900. "Kashmeriana").

The status of Chamaecyparis funebris (Endl.) Franco (Agros 24: 93. 1941) seems to be gaining recognition in the United States. It was accepted by Bailey (Hortus Third. 1977), Moore (Baileya 14: 4-5. 1966) and Mulligan (Intern. Dendrol. Soc. Yrbk 1975: 14-24. 1976). Mitchell (Conif. Brit. Isls. 1975) refers to it under Cupressus, however he compares it to Chamaecyparis lawsoniana Parl. because both taxa have flattened branchlets and leaves with translucent glands. Its small cones that open upon maturity are also characteristic of Chamaecyparis Spach. and therefore C. funebris should be classified in that genus. Chamaecyparis funebris grows fairly close to populations of Cupressus chengiana in Szechuan, China. It may be possible that there will arise bigeneric hybrids in future generations.

In my revision of Cupressus (Phytologia 49. 1981) I had recognized that to the best of my knowledge only two species of the genus hybridize in the wild. These are C. arizonica x C. lusitanica in northwest Durango, Mexico and C. macnabiana x C. sargentii in Lake Co., California. There are already other hybrids of the genus in cultivation, including a C. lusitanica x C. macrocarpa (Hillier, 1978). I do not think it is necessary to give all these hybrids formal Latin names which may result in confusion with recognized species. They are best left with two names indicating that they are indeed hybrids.

ARBORETA WITH NOTABLE COLLECTIONS

In addition to those cited in Phytologia 49: 419. 1981. the following arboreta have a fairly comprehensive collection of cypresses;

Botanic Garden, North Terrace, Adelaide, South Australia 5000, Australia. Most species represented.

National Botanic Gardens, Glasnevin, Dublin 9, Ireland. Most species represented.

I.N.R.A., Centre de Recherches Forestiers, Station d'Amelioration des Arbres Forestiers, Ardon 45160, Olivet, France. Most species represented.

Instituto di Botanica Agraria e Forestale, Firenze (Florence), Italy. Most species represented.

Westonbirt Arboretum, Tetbury, Gloucestershire, G18 8Q5, England, U.K.. Good variety of kinds.

Eddy Arboretum, Institute of Forest Genetics, 2480 Carson Road, Placerville, California, 95667, U.S.A. American and Mediterranean kinds represented.

Los Angeles State and County Arboretum, 301 North Baldwin Ave., Arcadia, CA 91006 U.S.A. Good variety of kinds represented.

Rancho Santa Ana Botanic Garden, 1500 North College Ave., Claremont, CA 91711, U.S.A.. California taxa.

Santa Barbara Botanic Garden, 1212 Mission Canyon Road, Santa Barbara, CA 93105, U.S.A. California kinds represented.

UCR Botanic Gardens, University of California, Department of Botany & Plant Sciences, Riverside, CA 92521 U.S.A. Most kinds represented.

Botanical Garden, University of California, Centennial Drive, Berkeley, CA 94720, U.S.A. Cupressus gigantea represented.

University of Washington Arboretum, Seattle, Washington 98195. Good variety of species represented.

Borde Hill Garden, Haywards Heath, West Sussex, RH16 1XP, England, U.K. Comprehensive collection.